

These are Pete Richerson's thoughts on the [workshop on cultural evolution](#) convened by Dan Dennett in Santa Fe in May 2014. Dennett's introduction is [here](#).

I do think that the disagreements among the various "schools" of cultural evolution represented at the meeting are relatively modest. I'll first outline areas where I think disagreements are minimal and then raise some points where important issues may be outstanding.

Areas of broad agreement (taking it for granted that people will always disagree in detail)

1. Importance of cognitive processes. Dan S, Olivier, and Nico especially stress the myriad ways in which culture depends upon cognitive processes and in which cultural evolution is affected by such processes. They rightly stress that Rob, Joe and I have used simple models, as one necessarily must, to study the dynamics of cultural evolution. To my way of thinking, "theory" in fields like the evolutionary sciences consists of a toolkit of models, each itself fairly simple. We get at complex phenomena substantially by the piece-wise construction of families of models making different simplifying assumptions relevant to the specific scientific question at hand. Having models that represent cognitive processes more faithfully, perhaps by simplifying the population dynamic processes that Rob and I originally concentrated on, is work well worth doing. Joe has branched out in that direction. Rob and his students have a Bayesian learning model unifies the individual and social learning inference process. Many studies of social learning in humans and animals provide a lot of data on the one-generation-to-the next time scale that one might use to test such models. For example, I think that Olivier's flop problem is quite real and is worthy of formalizing.

2. The concept of attraction. Until my reading for this meeting I did not appreciate how broad a set of phenomena attraction represents. I did not appreciate that local environmental contingencies could act as attractors. For Rob and I, and I think Joe, such contingencies are critical for assembling intricate cultural adaptations fairly quickly and in turn key for understanding how a costly cognitive apparatus for managing culture might have evolved in the first place. We may still have some different guesses about the importance of different classes of attractors but this is chiefly an empirical matter which is likely to be settled in due course.

3. The diversity of cases. Peter GS and Dan D make a very good case that some examples of both organic and culture are more paradigmatically "Darwinian" than others. (I use the scare quotes to mark that the paradigm is not Darwin's own formulations but the mid 20th Century Neo-Darwinian Synthesis with its hard gene based notions of transmission, the rigid proximate-ultimate distinction, and other things foreign to Darwin.) I have no problem with this idea. Rob's and my old models contained parameters that we imagined were under selection that measured the strength of faithful transmission versus the strength of, essentially, attractors. We paid disproportionate attention to the case where the transmission effects are fairly strong relative to attractors on the per generation time scale because the evidence suggested to us that humans are unusual in this regard.

4. I don't have a big problem with the concept of memes so long as the meme-gene analogy is not excessively rigid. Susan assures is that Rob's, Joe's and my old fears in this regard are unfounded.

Perhaps larger issues still outstanding

1. I continue to be impressed with the ongoing cognitive and comparative work on social learning. Kim's "evolved apprentice" seems to be exactly what humans are. The work of people like Susan Carey, Elizabeth Spelke, Paul Harris, Mike Tomasello, Karen Wynn, Paul Bloom, and their students and colleagues have constructed a reasonably detailed picture of how development in infancy brings

on line the cognitive machinery that makes humans a much more imitative species than any other studied to date. In typical animal social learning, the rate and fidelity of transmission is relatively low and the role of attractors is necessarily much stronger. Comparative studies of the aptitude of chimpanzees versus children for social learning highlight the unique importance of imitation and perhaps pedagogy in humans. For many culturally transmitted traits—syntax, word meanings, artifact construction skills, social norms and institutions—fidelity of transmission itself is very high. Biases and guided variation do modify and sort among variants acquired by social learners and that is very important too, especially to the extent that it is sensitive to environmental reinforcement. On Rob's, Joe's and my account, such transmission fidelity coupled to even weakish environmental reinforcement is necessary to understand the evolution of complex cultural adaptations and the spectacular cultural adaptive radiations of humans. From an ecological point of view, humans are the analog of thousands of biological species each carrying a mixture of arbitrary historical contingent differences and often exquisite adaptations to local circumstances. Why we came to have the capacity to do this and how it works are the biggest questions for evolutionary study of humans. Culture has worked so spectacularly for us you might think that any number of other lineages would have stumbled across high fidelity culture over the last 600 million years since complex animals have existed. I'm not sure everyone agrees with this agenda.

2. I have qualms about the concept of universal Darwinism. Culture/memes are a lot like genes in some respects and not like them in others. I see a shallow analogy where others seem to see a fundamental law-like similarity. Analogies are really useful things. They allow you to borrow concepts and models from other fields and save yourself having to invent too much new stuff. But the disanalogies are important too. At some point you've squeezed all the useful work out of the analogy and pursuing it any further will lead you down false paths. As Rob mentioned in the meeting, the population genetics style of modeling is a disciplined but flexible framework for milking the meme-gene analogy dry and then setting off on new paths dictated by the phenomenology of the problem you are interested in. For example, Donald Campbell, and Gerald Edelman suggested that the population genetic approach should be applicable to cognitive development. Olivier's word models and Dan S' model of attraction might be tackled with such a framework. Shrink the notional time step from a generation to a day in the life of a child learning new words from others that it interacts with. Children exercise some repertoire, hopefully a small repertoire, of attractors to acquire words others, who may or may not engage in a little pedagogy. They actively use some words and build a larger passive vocabulary, day by day. Thinking shallow analogies honors the diversity of processes that we call organic and cultural evolution and cognition.

3. Multi-level selection and multi-modal selection. Mark Pagel and Susan give primacy to selection on genes and selection on memes respectively. Rob convinced me early on in our partnership that sweeping generalizations about what "selection" favors are dangerous. Natural selection on genes admits to a number of modes. Selection on simple linear fitness gradients does one thing. Allow for rough fitness topographies and selection produces different results (as Peter G-S notes). Throw in density and frequency dependent selection. Add antagonistic selection in males or females, or at different ages. Mate choice and artificial selection introduce agent based rather than natural selection, demi-god designers if you want. With cultural evolution agent based social selection runs wild. The institutions of a society set up systems of rewards and punishments that heavily impact genetic fitness. Polly Wiessner once argued to me that in the Ju/'hoansi (!Kung San) that there is little punishment even for murder. But a multiply homicidal male is felt to be dangerous to the camp. If his relatives are willing to take the responsibility, and they normally are, he is semi-exiled to a distant camp where he lives with his relatives. At best, he can attract only an old woman as a wife. His genetic fitness is zeroed out as much as if he were executed.

Similarly, it is easy to imagine selection acting at multiple levels of organization, especially on

cultural variation. On the one hand, horizontal transmission of cultural variants sets up the possibility of selection for selfish memes. At the same time horizontal transmission is adapted to spread individual or group functional innovations to a large population rapidly. Genetically selected attractors tend to act like an immune system, favoring genetically advantageous cultural variants, as Mark P argues.

Institutions tend to be systems characteristic of a whole society or substantial parts of it. Such variation is an easy target for group selection. Some evolutionists want the selective design process to be a relatively orderly maximization-of-fitness process. True, absent that, the idea that selection produces adaptations is problematical. But I think that many evolutionary biologists consider the various forms of selection to result in a rather anarchic process. Cultural evolution, being a recently evolved system, is rather less orderly than the genetic system. Anarchy is as much the rule as the exception. In the Holocene, cultural group selection seems to have ever larger and better integrated social systems.

Against this large scale trend, every lineage of large scale societies seems to be a series of hot house flowers that bloom and bust. Despite invitations in Susan's and Mark's material and Rob's and my presentation on cultural group selection we did not have deep conversation at Santa Fe. I sense that we would be pretty various on the issues of modes and levels of "selection."